13907

03TB-109

The Future Tactical Truck System Advanced Collaborative Environment - Description and Benefits

Michael Archer
Michael Cadieux
U.S. Army TARDEC's National Automotive Center

ABSTRACT

The U.S. Army National Automotive Center's Advanced Collaborative Environment laboratory is providing a critical collaboration framework to support the design and development of the Future Tactical Truck System (FTTS). This paper describes how the Advanced Collaborative Environment (ACE) is being used today to intelligently connect program managers, war fighters, technology developers, platform integrators and other communities with relevant information using a highly interactive, stimulating and distributed environment. This paper also describes the enabling technologies of the ACE framework, as well as the tools and processes necessary to support the FTTS program.

INTRODUCTION

The development of any complex system inherently relies upon the successful and efficient communication among each relevant program stakeholder. The traditional forms of communication include e-mail, video teleconferencing, Microsoft® PowerPoint™ charts and shared Internet file storage systems. These communication mechanisms, however, do not address the requirement to easily provide relevant information to relevant stakeholders using understandable viewpoints. Thus a framework was established that specifically addresses this people and information integration.

As part of the Army's Simulation Based Acquisition initiative, engineers and scientists at the U.S. Army's National Automotive Center are empowering FTTS stakeholders with a unique set of collaborative tools and capabilities. These tools, collectively the Advanced Collaborative Environment (ACE), allow FTTS stakeholders to operate within a stimulating, interactive and distributed enterprise. This environment also allows decision makers to generate quality solutions based upon on-demand and real-time information that is both accurate and understandable. For instance, many critical design reviews conducted for Army acquisition programs now require the use of a virtual review that depicts functioning systems within a virtual space, as seen in Figure 1. This virtual design review allows systems engineers, managers and soldiers to jointly assess a system's design and provide important feedback.

Figure 1: System Design Review

MAIN SECTION

KEY ENABLING TECHNOLOGIES OF ACE

The two technologies of the ACE framework are web-based information technologies and immersive virtual environments. To ensure that these technologies were affordable and effective for the Army, the ACE laboratory partnered with commercial vendors to insert the Army's

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
10 NOV 2003	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
The Future Tactical Truck System Advanced Collaboration Environment - Description and Benefits	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
Michael Archer; Michael Cadieux	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
USA TACOM 6501 E 11 Mile Road Warren, MI 48397-5000	**13927**
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	TACOM TARDEC
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**SAR**	**4**	

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18

requirements into off-the-shelf products. The result of these partnerships is an ACE framework that is based solely on commercially available hardware and software.

Web-based Information Technology

The web-based information technology is based on a Paradigm Technology Corporation (PTC) product called Windchill. The Windchill software delivers an industrial strength information management system. Because Windchill is web-based, users are able to create, retrieve and interact with other people and data through traditional web tools such as URLs, search engines, applets, etc. Further, the hardware required to access this information can range from a desktop computer to a portable, device such as a BlackBerry® handheld. The out-of-the-box functionality that is important to the Army includes process and workflow facilitation tools and the ability to interface with existing information sources and related tools. This functionality is delivered through industry standards such as XML and Java.

Windchill's CAD visualization and markup technology is also a critical component of the web-based technology. This technology allows engineers to push lightweight three-dimensional (3D) representations of product designs onto the web. Figure 2 shows an example of a government-generated concept of the FTTS embedded within Microsoft's Internet Explorer. Distributed stakeholders are able to view 3D product designs on their own computers, using nothing more than a simple web browser plug-in. This visualization technology also provides a mechanism to capture and manage feedback. These feedback mechanisms are critical because they allow stakeholders to easily identify, describe and "pass along" issues to the right individuals within a timeframe of minutes, not hours or days.

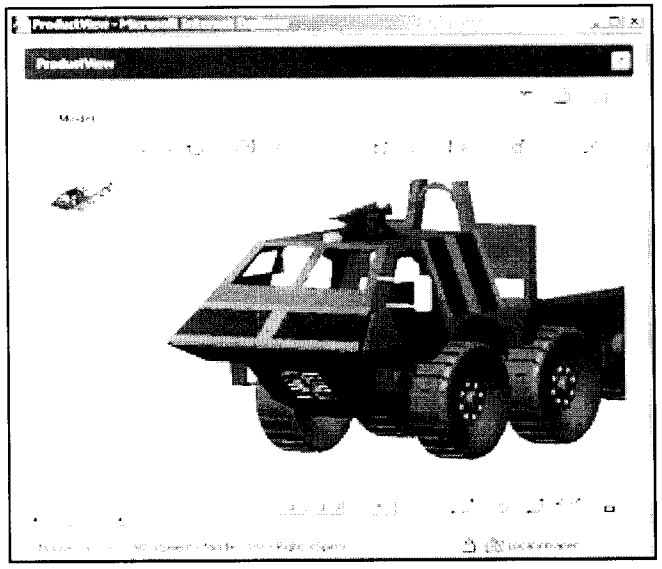

Figure 2: FTTS in ProductView

Immersive Virtual Environments

Immersive virtual environments allow a participant to see, touch, interact, understand, and improve a design without a physical prototype. The ACE framework relies on two major types of immersive devices: single wall systems and CAVE-like systems. Single wall systems display a stereo three-dimensional image on a flat or curved screen, allowing a large number of people to simultaneously view and evaluate a real engineering model. A CAVE environment surrounds the user with the 3D virtual scene, displaying a one-to-one scale image that provides the sense of actually being there, e.g. inside the crew cab of an FTTS design. By using immersive virtual environments, engineers and designers are able to show new vehicle components and functionality to stakeholders, long before any metal is actually bent.

The ACE laboratory has a number of immersive devices, including a CAVE at the U.S. Army TARDEC in Warren, MI as seen in Figure 3, a CAVE at Ft. Knox in Kentucky, and a transportable RAVE system. Immersive virtual environments can be connected together, allowing real-time collaboration at distributed locations. For example, this allows a program manager at TARDEC and a soldier at Ft. Knox to interactively view and manipulate the same system design as if they were both inside a physical vehicle. The ACE uses commercially available systems, currently utilizing hardware from Fakespace Systems, Inc., computers from Silicon Graphics Inc., and PTC's Division Mockup visualization software.

Figure 3: Soldier in CAVE

FUNCTIONAL VIEW OF ACE

The question becomes, "How can program managers and subject matter experts gain access to the information contained in a diverse set of tools, models, metrics, lifecycle processes, and other program elements?" Advanced Collaborative Environments. Although there is a long list of communities, the ACE

provides a set of common functions. These common functions include making information available and accessible on-demand, providing rapid access to critical information, supporting meetings with live information, and enabling the dissemination of product information during interactive brainstorming activities. Each function provides critical collaboration and relationships between each community involved in the development of the FTTS program.

The Advanced Collaborative Environment relies on these functions to support highly interactive and stimulating systems integration events. These events allow systems engineers, program managers, users, etc. to perform integration activities within a highly interactive, engaging, and distributed environment via the Web or immersive virtual reality devices. The following sections will depict how these "selfish islands" may use the ACE to keep on target within the acquisition timeline.

Supporting the Program Manager

The ACE aids the Program Manager with several unique and useful tools, including virtual design reviews in immersive environments, on demand retrieval of important information, and "live" access to data for the support of meetings and crucial decisions.

ACE virtual design reviews supplement or replace older, less engaging ways of evaluating future vehicle designs, providing an interactive platform to help the program manager become familiar with designs and operational scenarios early on in the design process. They also create a two way street to allow natural sharing of information and enable program managers, system engineers, and users to make joint decisions regarding a platform design. This highly interactive process allows program managers to make better quality decisions, brainstorm new ideas, and come to early consensus on key options. These benefits lead to a reduction in the number of hidden issues discovered at the end of the acquisition process, and therefore lower risks involved in fielding a new vehicle.

The secure web-based piece of the Advanced Collaborative Environment can be reached from anywhere in the world with an Internet connection, providing the program manager with a valuable tool to support a global business environment. Information and data about the product, program, Modeling & Simulation (M&S) and analyses relating to the product, is readily available and easily located by the program manager. Online threaded discussions enable the program manager to view relevant opinions while creating a history of deliberations on a particular subject.

In a review, decision, or status meeting, the ACE supplies access to information in real-time, pulling in other resources when needed and empowering the program manager to "make the decision now." Another advantage of the web-based technology is the support of sidebar or off-line discussions during a meeting, i.e. asking for more information without interrupting the main topic. The ACE also gives the program manager total connectivity to the "live" data at all times, such as an on-call expert or helpdesk, allowing rapid assessments of the current situation, and leading to the right decisions at the right time.

Supporting the War-fighter / End User

The Advanced Collaborative Environment connects the soldier to the FTTS early in the design process, allowing the end user to understand and evaluate new designs and functionality through the use of immersive virtual environments. These war-fighter evaluations lead to refined requirements and design changes at very low cost. By bringing soldiers into the design environment and soliciting their feedback, rapid and inexpensive tradeoffs can be determined. Operational, support, and training considerations can begin to be assessed and determined before the vehicle is actually in the soldiers' hands.

By capturing this feedback in the web-based portion of the ACE, communities from the platform integrator to the program manager have immediate and up-to-date results of the soldier evaluations, as seen in Figure 4.

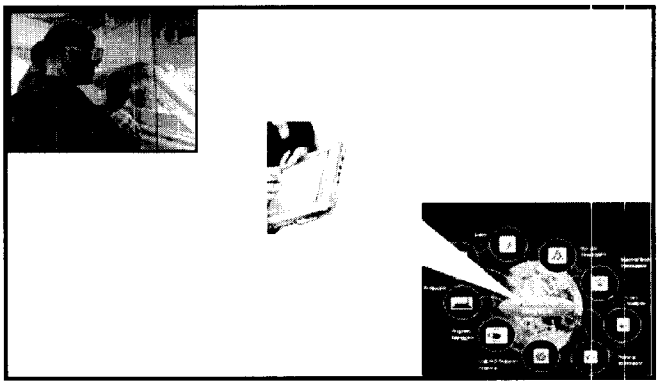

Figure 4: Design Review and Captured Feedback

Supporting The Platform Integrator

From the initial design ideas of a concept vehicle through the creation and production of a fielded vehicle, the ACE may be used by the platform integrator to rapidly evaluate and test new ideas and plans. The immersive virtual environment allows a number of designers with different backgrounds to come together and brainstorm alternatives in a shared space, where many different ideas can be explored and evaluated. As the design moves from concept to mature platform, the platform integrator may display system functionality and operation in the virtual world, enabling stakeholder input, and enriching the final design.

The ACE also enhances communication between the platform integrator and the various communities through

its web-based and immersive tools. Virtual design reviews eliminate the need for extensive Microsoft® PowerPoint™ presentations to describe new technologies and functions, and Windchill allows the platform integrator to be connected with the program manager and other critical communities at all times.

Supporting the Technology Developer

The Advanced Collaborative Environment bridges the gap between the technology developers and the vehicle platform. From active protection to robotics to wireless communication and sensors, developers can use the ACE tools to better define their technologies and manage their integration into the FTTS program. The ACE gives technology developers a vehicle to clearly explain new ideas and demonstrate how they could function on a vehicle, without needing a physical vehicle in place to perform integration studies.

Supporting Modeling & Simulation

The ACE provides a clear role in supporting the Modeling and Simulation activities for the FTTS program. This ACE support has wide-ranging benefits for both the modeling and simulation providers and the program management office. Simply stated, the modeling and simulation providers are able to stay more informed and more visible within a program. These benefits are derived from several ACE functions such as the M&S community's ability to gain a bigger view of the program, on-demand access to current system information and a means to communicate M&S results and get feedback. From a program management point of view, the ACE is used to manage all M&S activities and further enrich the decision making process by delivering M&S results in under stable views. For instance, the results of a fire suppression system analysis can be viewed from the desktop computer or an immersive virtual environment, as seen in Figure 5.

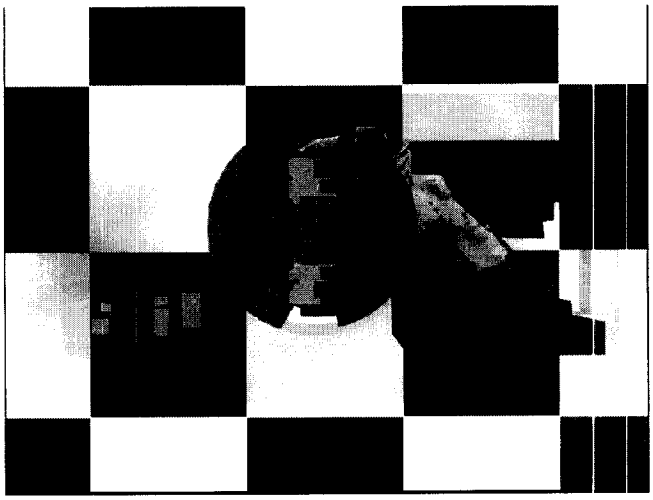

Figure 5: Fire Suppression System Analysis

CONCLUSION

A lynchpin for success of any technology development or demonstration effort, such as the U.S. Army's Future Tactical Truck System (FTTS), is the ability for all relevant stakeholders to effectively collaborate within a distributed environment. Distributed collaboration is essential as today's organizational structures evolve into globally dispersed and loosely linked teams. Members of these functionally dispersed teams must rely on collaborative relationships to share information with others. In addition, each organization must have mechanisms in place that allow individuals to stay informed in order to make quality decisions. Today's Advanced Collaborative Environment allows distributed functional experts to create, retrieve, process and share relevant information in an intuitive and collaborative environment. Use of these tools will enable the FTTS to become a showcase application for other Army acquisition programs.